IN THE CLAIMS:

1.(currently amended) A process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, applicable to two-way communication over the electricity network between a head-end and various user equipments that includes the means to add and extract a cyclic prefix to the OFDM symbols, including interpolators and decimators in the transmission and reception systems of the equipments and digital band translation, and which comprises the sending of synchronization sequences in the information that is sent via the downstream channel which runs from the head-end to the user equipments, to provide synchronization in frequency and time in reception, and ~~characterized in that~~ wherein the process comprises:

- ~~the generation~~ generating synchronization sequences by means of two identical synchronization symbols;

- ~~that are transmitted~~ transmitting periodically said sequences from the head-end equipment by the downstream channel to all the user equipments ~~which~~;

- ~~detect~~ detecting said synchronization sequences in reception by the user equipments;

- estimating the beginning of the OFDM symbol in order to synchronize in time by using maximum likelihood criteria so that time synchronization begins from the calculation of the maximum correlation of the samples of two received symbols, and this maximum becomes the mid point in the flat zone for the correlation peak, whose size in number of samples is equal to the number of samples of the cyclic prefix without intersymbol interference, ISI; and

- simultaneously estimating the sampling frequency error and carring out the frequency synchonization, by means of calculating the angle of this correction in the moment determined as maximum correlation, and selectively performing at least one of the following steps in order to synchronize in frequency:

- ~~and selectively estimate and correct~~ correcting the sampling frequency in the analog/digital converters that are included in the receptors in the user equipments; or

- ~~carry out a~~ re-sampling ~~of~~ the digital signal, ~~synchronization in frequency, and simultaneously estimate the moment each OFDM symbol begins, synchronization in time~~

2. (canceled)

3. (currently amended) The process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, according to claim 2 ~~1 characterized in that~~ wherein the correlation maximum is calculated by detecting the correlation peaks that surpass a threshold that corresponds to multiplying the power by a constant C, where the value of this maximum is taken to be the mid point of the flat zone in the correlation peak whose size in number of samples is equal to the number of samples of the cyclic prefix without intersymbol interference, ISI; where the value of the constant C is fixed to minimize the probability of producing false alarms, and the correlation is calculated by means of the following algorithm:

$$\gamma(m) = \sum_{k=m}^{m+l-1} r(k) r^*(k+n)$$

and the power is calculated by means of the following algorithm:

$$\xi(m) = \frac{1}{2} \sum_{k=m}^{m+l-1} \left(|r(k)|^2 + |r(k+n)|^2 \right) \cong \sum_{k=m}^{m+l-1} |r(k)|^2$$

where $\gamma(m)$ is the correlation at the moment of the sample m and $\xi(m)$ the power at the moment of the sample m, r(k) is the sample received in the moment k, r*(k+n) is the conjugation of the sample received in k+n, n=N+L and l=n, where N is the number of samples of one of the symbols in the synchronization sequence and L the number of cyclic prefix samples.

4. (currently amended) The process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, according to ~~Claims 2 and~~ claim 3, ~~characterized in that~~ wherein the calculation of correlation and power is undertaken iteratively, storing the samples and preferably the partial products of the current sample by the conjugated sample that arrived N+L samples before, for the calculation of the correlation and the power by means of the following algorithms:

$$P(d) = P(d-1) + (r_d r^*_{d-(N+L)}) - (r_{d-N} r^*_{d-(N+L)-N})$$

$$R(d) = R(d-1) + |r_d|^2 - |r_{d-N}|^2$$

where P(d) is the correlation, R(d) the power, r_d the current sample, r_{d-N} the sample that arrived at the receiver N samples before, $r^*_{d-(N+L)}$ the complex conjugation of the sample received N+L samples previously and $r^*_{d-(N+L)-N}$ the complex conjugation of the samples received 2N+L samples previously.

5. (currently amended) The process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, according to claim 3, ~~characterized in that~~ wherein once frequency error is less that a pre established threshold, only the real part of the correlation is used to simplify calculation.

6. (currently amended) The process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, according to claim 3, ~~characterized in that~~ wherein detection of the synchronization sequence is carried out by comparing the value of the correlation with the power value multiplied by a value C to minimize the probability of a false alarm, so that synchronization sequence and the optimum moment for the sample are searched for when the condition $|\gamma| > C\zeta$ is given, where C is a factor that multiplies the power so that this product may be used as a threshold.

7. (canceled)

8. (canceled)

9. (canceled)

10. (canceled)

11. (canceled)

12. (canceled)

13. (currently amended) The process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, according to claim ~~8~~ 1, ~~characterized in that~~ wherein ~~the frequency~~ synchronization ~~acquisition stage takes place after the time synchronization~~ of the sampling frequency comprises an acquisition stage and a tracking stage, where said acquisition stage ~~and said stage~~ includes the estimation of sampling frequency error beginning from the correlation angle in the maximum moment of this metric, using the moment situated in the centre of the flat zone of the maximums of the metric, according to the following algorithm:

$$\angle\gamma(\theta_{opt}) = -2\pi f_c M(N+L)(\frac{\Delta f_s}{f_s + \Delta f_s})$$

where M is the interpolation and decimator factor, f_c the carrier frequency, f_s the sampling frequency and Δf_s the sampling frequency error; it further comprises a compensation stage for this error by means of a frequency corrector element, selectively consisting of an oscillator controlled by voltage or a re sampler with its associated filters (12), and beginning from the previous algorithm it calculates the angles of the correlation in the moment in which this metric is maximum, for which it calculates the arctangent of the ratio of the imaginary part and the real part of the correlation and obtaining Δf_s by the algorithm mentioned previously, these steps being repeated iteratively until the estimation of sampling frequency error is less than a certain threshold.

14. (currently amended) The process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, according to ~~Claims 8 or~~ claim 13,

~~characterized in that~~ wherein synchronization of the sampling frequency comprises an acquisition stage and a tracking stage, where the frequency tracking stage consists of multiplying the received signal by a rotor which compensates the rotation of the constellation in each carrier in the frequency domain, for which the speed of the rotation of the constellation is calculated in each carrier received.

15. (currently amended) The process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, according to claim 14, ~~characterized in that~~ wherein to calculate the speed of the rotation of the constellation of each carrier in reception, a grid is periodically sent during transmission in the downstream channel which obliges the head-end to use a fixed modulation, preferably a modulation with low signal to noise demodulation needs, in some carriers known as grid carriers whose position varies in time when these carriers are used to transmit information; so that the users know the position of the grid carriers and can undertake the process of line quality monitoring in these carriers knowing the modulation used by these, whether the user is the destination of the information sent by these grid carriers or not; with the characteristic that the users do not know a priori if they are the destination or not for the information modulated in these carriers.

16. (currently amended) The process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, according to claim 15, ~~characterized in that~~ wherein the maximum period for the grid is fixed beginning from the maximum rotation in the carrier with the greatest frequency, so as not to produce overflows, so that N_T is the period of the grid in symbols, that is, the maximum number of symbols between two consecutive measurements of the angle in a determined carrier, and the grid is distributed over the N carriers in the system requiring that all the carriers belong to the grid once during N_T symbols and that:

$$\sum_{i}^{N_T} N_i = N$$

where the sum of the number of carriers belonging to the grid during N_T symbols is equal to the total number of carriers in the system, where N_i is the number of carriers belonging to the grid in

the symbol i; so that following N_T symbols a new measure of the speed of the rotation in each one of the carriers is obtained.

17. (currently amended) The process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, according to claim 15, ~~characterized in that~~ wherein to calculate the speed of the rotation in reception the user demodulates the information sent by the grid carriers knowing a priori the modulation used by these, whether or not the user is the destination of the information being sent by the head-end, and calculates the rotation angles regarding the constellation transmitted, so that comparing these angles with the previous calculation for the same carriers and dividing by the time between both angle estimates, the rotation speed for these carriers is calculated.

18. (currently amended) The process for synchronization in the downstream of multiple users in a point to multipoint system with OFDM modulation, according to claim 15, ~~characterized in that~~ wherein in the tracking stage, frequency error is estimated by measuring the mean value of the rotated angle of the constellation of each one of the carriers in one symbol and this error is corrected by a frequency corrector element, where this mean value is equivalent to the correlation angle.